

REMARKS

Claims 1-17 and 29 are now pending in the application. Claims 18-28 are canceled. Claims 1, 7, 10, 15-17 are amended: the arrangement of claim 1 is changed; "gas" is added to "diffusion medium" in claims 7 and 17; claim 10 is amended to include "about," support is found in paragraph [0030]; "a" is added before "gas diffusion medium" in claim 15; and the dependency of claim 16 is changed, support is found at [0025]. Claim 29 is new; support is found in paragraph [0035]. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

DRAWINGS

Figure 1 stands objected to, as according to the Office Action, only that which is old is illustrated and should be designated by a legend such as --Prior Art--. Applicant respectfully submits that Figure 1 does not describe prior art, but is a schematic, exploded illustration of a PEM fuel cell stack, showing only two cells, in accordance with an embodiment of the present invention. For example, the exploded view of Figure 1 shows the channels 20, 22 on a bipolar plate 8 that press up against the carbon/graphite papers 34, 36, 38, 40 that press up against the electrode faces of the MEAs 4, 6. See paragraph [0016]. These are all features in accord with various embodiments of the present invention. For example, similar embodiments of such fuel cell stacks are shown in cross-section in Figures 4, 5, and 8. Withdrawal of the objection is respectfully requested.

REJECTION UNDER 35 U.S.C. § 102 – TANEMOTO ET AL.

Claims 1-6 and 14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Tanemoto et al. (U.S. Pat. No. 6,395,416). This rejection is respectfully traversed.

The present invention includes a fuel cell having a membrane electrode assembly and an electrically conductive member. See paragraph [0003]. The membrane electrode assembly comprises an ionically conductive member, such as for example, a proton exchange membrane, and at least one electrode disposed at the ionically conductive member. See paragraph [0017]. The electrically conductive member is adjacent to the electrode and has a major surface. A flow field including conductive particles dispersed in a binder is defined by lands patterned on the major surface of the electrically conductive member. For example, the electrically conductive member can be a plate made of metal, composite, or polymeric materials, and the plate can be a bipolar plate. See paragraph [0018]. The flow field can be a plurality of lands which define a plurality of grooves through which the fuel cell's reactant gases (i.e., H₂ or O₂) flow from one side of the electrically conductive member (e.g., a bipolar plate) to another side. See [0020].

The Tanemoto reference does not include both an electrically conductive member and a flow field. Instead, Tanemoto describes only a collector (the center portion of the separator) that is formed of electrically conductive filler and a resin binder molded to form channels. See Tanemoto, feature 102 in Figures 1, 2, and 5; and see col. 5, lines 12-17, 25-54. As such, the Tanemoto collector is missing at least one component of the present invention – the electrically conductive member (e.g., a plate, such as a bipolar plate, formed of metal, composite, or polymeric materials).

Consequently, the present invention cannot be anticipated by the reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) ("A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.").

Applicant also notes that there is no suggestion in Tanemoto to incorporate an electrically conductive member into the collector; and furthermore, the reference would not motivate a skilled artisan to add an electrically conductive member, or plate, to a flow field comprising conductive particles dispersed in a binder wherein the flow field is defined by lands patterned on the major surface of the electrically conductive member. Instead, the Tanemoto reference discloses a collector formed of a resin binder and an electrically conductive filler that is framed by a separate manifold portion. This construction allows the separator to withstand a large compression force in assembly of the fuel battery, permitting the center, channeled collector portion to stand alone, for example, without being patterned onto an electrically conductive member as in the present invention. See Tanemoto col. 3, lines 13-24; lines 49-58. As a result, the electrically conductive member of the present invention is not only absent from the Tanemoto reference, but the reference teaches away from using such a member to pattern the channeled collector portion thereon. Withdrawal of the rejection and reconsideration are respectfully requested.

REJECTION UNDER 35 U.S.C. § 103 – TANEMOTO IN VIEW OF SWATHIRAJAN

Claims 7-9 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanemoto et al. (U.S. Pat. No. 6,395,416) in view of Swathirajan et al. (U.S. Pat. No. 5,272,017). This rejection is respectfully traversed.

An embodiment of the present invention, as described in Claim 7, includes an electrically conductive member that comprises a plate having a major surface. The major surface of the plate faces an electrode, with a gas diffusion medium disposed between the major surface and the electrode, and lands of the flow field (comprising conductive particles dispersed in a binder) abutting the gas diffusion medium.

Combination of the Tanemoto and Swathirajan references fails to produce the present invention in that the combination lacks an electrically conductive member, being a plate in the claims in issue. Addition of the carbon cloth current collectors (see Swathirajan Figure 1, features 30 & 32; and see col. 3 lines 59-64) to the collector (center portion of the separator) of Tanemoto still lacks at least the aforementioned electrically conductive member of the present invention. Moreover, there is no suggestion or motivation in either reference to incorporate both an electrically conductive member having a major surface and a flow field defined by lands patterned on the major surface. The Tanemoto reference, if anything, teaches away from addition of an electrically conductive member, as the reference describes at length ways to construct of a manifold around a collector to form a separator resistant to compressive force. See Tanemoto col. 3, lines 13-24; lines 49-58. That is, the Tanemoto collector is a stand alone composite of conductive material and binder defining lands, which is not patterned on an electrically conductive member. Accordingly, the claims in issue

are nonobvious. Withdrawal of the rejection and reconsideration are respectfully requested.

REJECTION UNDER 35 U.S.C. § 103 – TANEMOTO IN VIEW OF YAMADA

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanemoto et al. (U.S. Pat. No. 6,395,416) in view of Yamada et al. (U.S. Pat. No. 6,500,893). This rejection is respectfully traversed.

An embodiment of the present invention, described in Claim 10, includes a fuel cell having a membrane electrode assembly and an electrically conductive member. The electrically conductive member comprises a major surface having a flow field patterned thereon defining lands, where the lands include conductive particles dispersed in a binder. These lands include about 50 percent of conductive particles and about 50 percent of binder.

As described above, the Tanemoto reference fails to include at least an electrically conductive member with a flow field. Use of the resin and filler formulations in Yamada with the separator from Tanemoto, therefore, fails to reproduce the present invention. Neither reference suggests, nor would a skilled artisan be motivated, to include an electrically conductive member, as described in the present invention. In effect, the construction of the manifold and collector to form the separator described in Tanemoto would dissuade the skilled artisan from incorporating a flow field on the major surface of an electrically conductive member. Therefore the present invention as embodied in Claim 10 is nonobvious in view of the Tanemoto and Yamada references. Withdrawal of the rejection and reconsideration are respectfully requested.

REJECTION UNDER 35 U.S.C. § 103 – TANEMOTO IN VIEW OF SWATHIRAJAN AND McMANUS

Claims 11-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanemoto et al. (U.S. Pat. No. 6,395,416) in view of Swathirajan et al. (U.S. Pat. No. 5,272,017) and McManus et al. (U.S. Pat. App. Pub. No. 2003/0198857). This rejection is respectfully traversed.

An embodiment of the present invention, as described in Claim 11, includes an electrically conductive member and a flow field where the height of at least two of the lands of the flow field varies between regions of the major surface of the electrically conductive member.

The combination of Tanemoto, Swathirajan, and McManus fails to reproduce the present invention in that no combination includes an electrically conductive member in addition to a flow field comprising conductive particles dispersed in a binder wherein the flow field is defined by lands patterned on the major surface of the electrically conductive member. In particular, the collector of Tanemoto does not include an electrically conductive member, and no combination of the Tanemoto collector, the Swathirajan carbon cloth current collector, and the McManus reference would suggest or motivate a skilled artisan to incorporate the electrically conductive member as described in the present invention. As a result, the present invention is nonobvious, as no combination of the aforementioned references includes, suggests, or would motivate a skilled artisan to include an electrically conductive member. Withdrawal of the rejection and reconsideration are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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